Biological Evaluation
for the

BWCAW NON-NATIVE INVASIVE PLANT MANAGEMENT PROJECT

Terrestrial Wildlife Evaluation and Assessment:

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Aquatic Wildlife Evaluation and Assessment:

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Executive Summary

This Biological Evaluation analyzes the effects of the Non-Native Invasive Plant (NNIP) Management Project on Region 9 Regional Forester's Sensitive Species (RFSS). There are approximately 14.3 acres of known NNIP that would be treated, and future NNIP infestations may be treated as well depending on the alternative. For Alternative 1, all of the known infestations would be treated by handpulling. Under Alternative 2, a combination of herbicide spot application and handpulling would be used to treat all of the known infestations, plus approximately 40-60 acres of NNIP that may spread in the project area in the future. Under Alternative 3, handpulling would be used to treat all of the known infestations plus approximately 600-650 acres of NNIP that may spread in the project area in the future.

Overall, the herbicide use proposed for Alternative 2 would pose a greater risk to RFSS plants than to aquatic or terrestrial RFSS animals simply because herbicides are designed to be toxic to plants.

For terrestrial RFSS wildlife, Alternative 1 has a low risk of effects to olive sided fly catcher, bay breasted warbler, and Connecticut warbler, and Alternative 3 poses no risk of effects. Alternative 2 has a low risk of effects to Eastern heather vole and no risk to the other species. The project would not cause any effects to habitat for RFSS wildlife. The herbicides proposed for use are low toxicity and the species are unlikely to be exposed to them except for heather vole. However, the risk to heather vole is low.

For aquatic RFSS species, Alternative 1 has a low risk of effects to lake sturgeon, northern brook lamprey, creek heelsplitter, and black sandshell. Alternatives 2 and 3 pose no risk of effects to

aquatic RFSS species. Operational Standards and Guidelines would protect water quality, and the low herbicide toxicity and project design would make the risk of negative health effects to aquatic RFSS extremely low.

For RFSS plants, Alternative 1 could impact RFSS plants that grow in disturbed areas. Handpulling NNIP could inadvertently cause damage to nearby RFSS plants. Alternative 2 could also impact RFSS plants that grow on rock outcrops and in disturbed habitats. Herbicide drift could inadvertently kill adjacent RFSS plants. Operational Standards and Guidelines would limit impacts to RFSS plants. Alternative 3 could impact RFSS plants that grow on rock outcrops and in disturbed habitats. Handpulling NNIP could inadvertently cause damage to nearby RFSS plants. In the long term RFSS habitat would benefit from controlling and eradicating NNIP.

Determination of Effects Summary

Terrestrial species

Alternative 1 would have no impact on heather vole, northern goshawk, boreal owl, great grey owl, wood turtle, Mancinus alpine, red disked alpine, Jutta arctic, Nabokov's blue, Freija's grizzled skipper, little brown myotis, northern myotis, tri-colored bat, gray wolf, or bald eagle.

Alternative 1 may impact individuals of olive sided fly catcher, bay breasted warbler, or Connecticut warbler, but is not likely to result in a trend towards federal listing or a loss of viability.

Alternative 2 would have no impact on northern goshawk, boreal owl, gray wolf, olive-sided flycatcher, little brown myotis, northern myotis, tri-colored bat, bay-breasted warbler, bald eagle, Connecticut warbler, three-toed woodpecker, great gray owl, Frieja's grizzled skipper, Taiga alpine, or Nabokov's blue.

Alternative 2 may impact individual Eastern heather vole, but is not likely to cause a trend to federal listing or a loss of viability.

Alternative 3 would have no impact on any terrestrial RFSS wildlife species.

Aquatic species

Alternative 1 would have no impact on shortjaw cisco, Nipigon cisco, headwaters chilostigman caddisfly, ebony boghaunter, and Quebec emerald.

Alternative 1 may impact individuals of lake sturgeon, northern brook lamprey, creek heelsplitter, and black sandshell but is not likely to result in a trend towards federal listing or a loss if viability.

Alternative 2 would have no impact on any aquatic RFSS species.

Alternative 3 would have no impact on any aquatic RFSS species.

Vascular plants, lichens, and byrophytes

For Alternative 1, the proposed activities would have no impact on alpine milkvetch, creeping rush, swamp beggar-ticks, floating marsh-marigold, linear-leaved sundew, neat spike rush, moor rush, auricled twayblade, fall dropseed muhly, American shoregrass, dwarf water lily, Oakes' pondweed, awlwort, lance-leaved violet, *Cladonia wainoi,* large-leaved sandwort, long leaved arnica, maidenhair spleenwort, Ross' sedge, sticky locoweed, nodding saxifrage, encrusted saxifrage, smooth woodsia, *Arctoparmelia centrifuga, Arctoparmelia subcentrifuga,* Douglas hawthorne, Appalachian fir clubmoss, small shinleaf, cloudberry, fairy slipper, ram's head ladyslipper, western Jacob's ladder, *Caloplaca parvula, Certraria aurescens, Frullania selwyniana, Menegazzia terebrata, Ramalina thrausta, Sticta fuliginosa, Usnea longissima*, *Pseudocyphellaria crocata,* moschatel, triangle grapefern, goblin fern, New England sedge, Chilean sweet cicely, Braun's holly fern, Canada yew, barren strawberry, Canada ricegrass, rough fruited fairy bells, or *Peltigera venosa*.

The proposed activities in Alternative 1 may impact individuals of common moonwort, Michigan moonwort, pale moonwort, ternate grapefern, and least moonwort but are not likely to cause a trend to federal listing or loss of viability.

For Alternative 2, the proposed activities would have no impact on alpine milkvetch, swamp beggar-ticks, floating marsh-marigold, linear-leaved sundew, neat spike rush, moor rush, creeping rush, auricled twayblade, fall dropseed muhly, American shoregrass, dwarf water lily, Oakes pondweed, awlwort, lance-leaved violet, fairy slipper, ram's head ladyslipper, small shinleaf, cloudberry, *Caloplaca parvula, Certraria aurescens, Frullania selwyniana, Menegazzia terebrata, Pseudocyphellaria crocata, Ramalina thrausta, Sticta fuliginosa, Usnea longissima*, Ross' sedge, sticky locoweed, Canada ricegrass, rough-fruited fairybells, Canada yew, barren strawberry, *Peltigera venosa,* moschatel, triangle grapefern, goblin fern, New England sedge, Chilean sweet cicely, false asphodel, and western Jacob's ladder.

For Alternative 2, the proposed activities may impact individuals of long-leaved arnica, maidenhair spleenwort, common moonwort, Michigan moonwort, pale moonwort, ternate grapefern, least moonwort, Douglas hawthorn, large-leaved sandwort, Appalachian fir clubmoss, Braun's holly fern, nodding saxifrage, encrusted saxifrage, smooth woodsia, *Arctoparmelia centrifuga*, *Arctoparmelia subcentrifuga*, and *Cladonia wainoi* but are not likely to cause a trend to federal listing or loss of viability.

For Alternative 3, the proposed activities would have no impact on alpine milkvetch, swamp beggar-ticks, floating marsh-marigold, linear-leaved sundew, neat spike rush, moor rush, creeping rush, auricled twayblade, fall dropseed muhly, American shoregrass, dwarf water lily, Oakes pondweed, awlwort, lance-leaved violet, fairy slipper, ram's head ladyslipper, small shinleaf, cloudberry, *Caloplaca parvula, Certraria aurescens, Frullania selwyniana, Menegazzia terebrata, Pseudocyphellaria crocata, Ramalina thrausta, Sticta fuliginosa, Usnea longissima*, Ross' sedge, sticky locoweed, Canada ricegrass, rough-fruited fairybells, Canada yew, barren strawberry, *Peltigera venosa,* moschatel, triangle grapefern, goblin fern, New England sedge, Chilean sweet cicely, false asphodel, and western Jacob's ladder.

For Alternative 3, the proposed activities may impact individuals of long-leaved arnica, maidenhair spleenwort, common moonwort, Michigan moonwort, pale moonwort, ternate

grapefern, least moonwort, Douglas hawthorn, large-leaved sandwort, Appalachian fir clubmoss, Braun's holly fern, nodding saxifrage, encrusted saxifrage, smooth woodsia, *Arctoparmelia centrifuga*, *Arctoparmelia subcentrifuga*, and *Cladonia wainoi* but are not likely to cause a trend to federal listing or loss of viability.

Additional Mitigations and Design Features

- For active bald eagle nests, do not treat NNIP occurrences #4249, #4250, #4342, #4343, #4033, #4032, #4097, #4095, #4096, #4366, #4093, #4094, #4091, #4092, #4388, #4389, #2298, #2365, #2366, #21158, #2328 from March 1 to August 30 to minimize disturbance to nearby bald eagle nests.
- For spotted knapweed (#2036) and hawkweed (#2583), survey for least moonwort prior to treating NNIP and protect during NNIP treatment by using wipe-on herbicide application for NNIP treatments at this site.
- For hawkweed (#2287) and oxeye daisy (#2288), survey for small shinleaf prior to treating NNIP and protect during NNIP treatment by using wipe-on herbicide application for NNIP treatments at this site.
- For hawkweed (#7661 and #7662), survey for Franklin's phacelia prior to treating NNIP and protect during NNIP treatment by using wipe-on herbicide application for NNIP treatments at this site.
- For hawkweed (#6891) and oxeye daisy (#6892), survey for lance-leaved violet prior to treating NNIP and protect during NNIP treatment by using wipe-on herbicide application for NNIP treatments at this site.

Biological Assessment/Biological Evaluation

1.0 INTRODUCTION:

This Biological Evaluation (BE) evaluates the effects of the proposed BWCAW Non-Native Invasive Plant Management (NNIP) Project on Regional Forester-listed sensitive species (RFSS). The BE tiers to the Programmatic Biological Evaluation for the revision of the Forest Plan (USDA Forest Service 2004) and provides more specific information on site-specific effects of the project to RFSS species. This BE was prepared in compliance with U.S. Department of Agriculture (USDA) Forest Service Manual sections 2670.3, 2670.5 (3), 2672.4, the Endangered Species Act of 1973 as amended, the National Forest Management Act of 1976, the Superior National Forest Land and Resource Management Plan, and Recovery Plans and Conservation Assessments and Strategies. The species evaluated in this report include all species on the Region 9 sensitive species list (USDA Forest Service 2011).

The management objective is to maintain viable and well-distributed representation of all native species that occur on the Superior National Forest (National Forest Management Act Regulation 219.19 and 219.26, Secretary of Agriculture Regulation 9500-4, USDA Forest Service Manual 2670.12, 2670.22, and 2670.32, Forest Plan p. 3-4). I used the following working definitions for viability and well-distributed from Iverson and René (1997):

- viability--the likelihood that habitat conditions will support persistent and well-distributed populations over time;
- well-distributed--species and habitat distribution are based on the current and historic natural distribution and dispersal capabilities of individual species, and dispersal includes the concepts of metapopulation dynamics and gene flow.

1.1 NO ACTION (ALTERNATIVE 1)

Under the no action alternative the Superior National Forest would implement the existing management decision from the 2006 Decision Notice for the Superior National Forest Non-native Invasive Plant Management Project (2006). The 2006 Decision Notice authorizes use of manual treatment methods to treat approximately 5.5 acres of NNIP that were known in the BWCAW in 2006 plus the approximately 8.8 acres of NNIP that have been found since then for a total of 14.3 acres, or in other words, all the known NNIP in the wilderness. An integrated pest management approach would be used. This means that not only would the Forest implement treatments proposed here, we would also continue to implement existing programs of prevention, coordination, inventory and monitoring, and education to reduce the risk of future NNIP impacts.

1.2 PROPOSED ACTION (ALTERNATIVE 2)

In order to maintain and improve aquatic and terrestrial wildlife habitat, to maintain healthy, resilient native plant communities, and to maintain the character and ecological integrity of the Boundary Waters Canoe Area Wilderness (BWCAW), the Superior National Forest proposes to implement a non-native invasive plant management project, beginning with treatments on a total of approximately 14.3 acres at sites scattered across the 1.1 million acre wilderness and possibly expanding up to 40-60 acres over the next 10 years. The Forest Service proposes to manage NNIP populations using an integrated combination of control methods based on the species and site. These control methods would include hand pump or sponge herbicide application and

manual control methods. The sites proposed for treatment are shown on proposed action maps in DEIS Appendix A. Table 1 summarizes the proposed treatments.

Table 1. Treatment summary for proposed action (see map in DEIS Appendix A for specific locations)

KNOWN NNIP LOCATIONS (1137 sites)				
Species Name	**Total acres**	**Acres manual control**	**Acres using herbicide**	**Herbicide**
Bull thistle	0.07	0.07		
Canada thistle	2.9		2.9	Aminopyralid
Cypress spurge	0.1		0.1	Imazapic
Goutweed	1.8		1.8	Metsulfuron methyl
Non-native hawkweeds	2.8		2.8	Aminopyralid
Leafy spurge	0.02		0.02	Imazapic
Oxeye daisy	1.5		1.5	Aminopyralid
Purple loosestrife	0.3		0.3	Triclopyr
Siberian peabush	0.0002		0.0002	Triclopyr
Spotted knapweed	3.4	3.4		
St. Johnswort	0.004		0.004	Metsulfuron methyl
Tansy	1.4		1.4	Metsulfuron methyl
Tatarian honeysuckle	0.02		0.02	Triclopyr
TOTALS (known infestations)	**14.3**	**3.5**	**10.8**	
PROJECTED FUTURE NNIP LOCATIONS				
Approximately 40-60 acres of herbicide or manual treatments				

These treatments would occur over the next ten years. A ten-year treatment period is needed because many of the species listed in Table 1 produce seed that remains viable in the soil for 7-10 years or more (Schultz 2011); therefore, follow-up treatments would be needed as described below. Implementation would begin in summer 2013. Of the 1137 known NNIP occurrences, most occur on campsites (48%), while others occur on portages or trails (26%), along shorelines (13%), at old resort/cabin sites (7%), or in burned areas (6%). Information about the proposed herbicides is summarized in Table 2.

Manual methods would be used for the tap-rooted species bull thistle and spotted knapweed; pulling one of these species and getting the whole taproot kills the plant. Herbicide application would be used for the remaining species which have rhizomatous root systems that make manual methods ineffective (a rhizome is a horizontal underground root).

Table 2. Proposed Herbicides and Treatment Methods

Common chemical name	Examples of trade names	Targeted Use	Weeds targeted
Triclopyr	Garlon3A®	Stump treatment, foliar treatment; broadleaf-selective	Siberian peabush, Tatarian honeysuckle, purple loosestrife
Imazapic	Plateau®	Foliar treatment, non-selective	Leafy spurge, Cypress spurge
Aminopyralid	Milestone® VM	Foliar treatment; broadleaf selective	Canada thistle, Hawkweeds, Oxeye Daisy
Metsulfuron methyl	Escort XP®	Foliar treatment; broadleaf selective	Tansy, St. Johnswort, Goutweed

All herbicides would be used according to manufacturer label direction (e.g., regarding rates, concentrations, frequency of application, and application methods). All herbicides would be applied using ground-based spot application. Spot application directs herbicides to target plants with minimal exposure to humans, desirable vegetation, or other non-target organisms. Two pieces of equipment would be used for spot application: a small hand pump connected to a spray wand, and a wipe-on applicator. Wipe on methods involve rubbing a sponge wetted with herbicide against a leaf surface or a cut stump; this method would be used for purple loosestrife, on NNIP on rock outcrops next to waterbodies, and for stump treatments of woody species. The hand pump would be used for spot application on NNIP located more than 25 feet from water. There would be one herbicide application per site per year with follow-up monitoring and possible treatment in subsequent years, consistent with label direction regarding application frequency.

Manual treatments would be conducted on the tap-rooted species bull thistle and spotted knapweed. The plant and its tap root would be removed from the ground by pulling or digging. After treatment, NNIP remains would be disposed of in such a way as to prevent them from starting a new infestation elsewhere.

The environmental characteristics and toxicity of the herbicides proposed for use are summarized briefly in Table 3 and in more detail in BE Appendix A – Herbicide Reference Tables. For more details about the alternatives, see Chapter 2 of the EIS.

Table 3. Environmental characteristics and toxicity of proposed herbicides

Herbicide	Soil mobility	Average Soil half-life	Water half-life	Toxicity to Mammals	Toxicity to Birds	Toxicity to Fish	Toxicity to Invertebrates
Triclopyr	moderate-high	30 days	4 days (but only hours in sunlight)	low	low	low	low
Imazapic	low	106 days	1-2 days	low	low	low	low
Aminopyr-alid	moderate-high	104 days (lab study); 32 days in field study	½ day	low	low	low	low
Metsulfur-on methyl	Moderate-high	120-180 days	1-8 days	low	low	low	low

Table 3. Environmental characteristics and toxicity of proposed herbicides

Herbicide	Soil mobility	Average Soil half-life	Water half-life	Toxicity to Mammals	Toxicity to Birds	Toxicity to Fish	Toxicity to Invertebrates

*Technical grade glyphosate has low toxicity to fish, but the surfactants in some formulations are highly toxic to fish. Some formulations of glyphosate are labeled for aquatic use.
SOURCE: BE Appendix A

1.3 ALTERNATIVE 3

Under Alternative 3 the Superior National Forest proposes to use manual treatment methods to treat approximately 14.3 acres of known NNIP infestations plus approximately 600-650 acres of new NNIP infestations that may be found in the future. An integrated pest management approach would be used. This means that not only would the Forest implement treatments proposed here, we would also continue to implement existing programs of prevention, coordination, inventory and monitoring, and education to reduce the risk of future NNIP impacts.

1.4 COMPARISON OF ALTERNATIVES

Table 4 provides a brief comparison of Alternatives 1, 2, and 3.

Table 4. Comparison of alternatives

	Alternative 1 – No Action	Alternative 2- Proposed Action	Alternative 3
Known NNIP acres proposed for treatment	14.3 acres	14.3 acres	14.3 acres
Estimate of maximum NNIP spread	600-650 acres	40-60 acres	600-650 acres
Estimate of additional NNIP to treat as new infestations are found	No authority for treating additional infestations	40-60 acres	600-650 acres
Number of treatments required to control small populations	Tap-rooted species: 2-3 Rhizomatous species: 3-5	Tap-rooted species: 2-3 Rhizomatous species: 2	Tap-rooted species: 2-3 Rhizomatous species: 3-5
Number of treatments required to control large populations	Tap-rooted species: 3-5 Rhizomatous species: 10	Tap-rooted species: 3-5 Rhizomatous species: 2-4	Tap-rooted species: 3-5 Rhizomatous species: 10

2.1 DESCRIPTION OF AFFECTED SPECIES

The species evaluated include all animals and plants on the Region 9 Regional Foresters Sensitive Species (RFSS) Plants list for the Superior National Forest (USDA Forest Service, 2012). Table 5 displays all RFSS plants and animals known or expected to occur on the Superior National Forest. The Minnesota DNR's Rare Features Database (MNDNR 2012) was used to evaluate species habitat and presence/absence for this analysis. Species listed in Table 5 that do not have potential habitat present and are not known to occur within the project area will not receive further discussion in this BE.

Table 5. RFSS Species Known Or Suspected to Occur in BWCAW NNIP Management Project Area

Scientific name **Common name**	Potential Habitat Present in project area	Known Species Presence in project area	Habitat Summary
SENSITIVE SPECIES: TERRESTRIAL WILDLIFE			
Eastern Heather vole *Phenacomys ungava*	Yes	Yes	Forest, brushland or clearcuts with *Vaccinium* spp. and rocks.

Table 5. RFSS Species Known Or Suspected to Occur in BWCAW NNIP Management Project Area

Scientific name **Common name**	**Potential Habitat Present in project area**	**Known Species Presence in project area**	**Habitat Summary**
Northern goshawk *Accipiter gentilis*	Yes	Yes	Large patch of older trees with closed canopy and open understory.
Boreal owl *Aegolius funereus*	Yes	Probable	Secondary cavity nester. Old boreal forest (inc. aspen) next to lowland conifer foraging areas. .
Gray wolf *Canis lupus*	Yes	Yes	Variety of habitats, adequate prey, low human disturbance
Olive-sided flycatcher *Contopus cooperi*	Yes	Probable	Snags, low density conifer lowlands, riverine/riparian areas.
Little brown myotis *Myotis lucifugus*	Yes	Probable	Winter hibernaculum: caves, mines, tunnels, buildings. Summer: large diameter trees, loose bark, snags, wetlands, riparian
Northern myotis *Myotis septentrionalis*	Yes	Probable	Winter hibernaculum: caves, mines, tunnels, buildings. Summer: large diameter trees, loose bark, snags, wetlands, riparian
Tri-colored bat *Perimyotis subflavus*	Yes	Probable	Winter hibernaculum: caves, mines, tunnels, buildings. Summer: large diameter trees, loose bark, snags, wetlands, riparian
Bay-breasted warbler *Dendroica castanea*	Yes	Probable	Mature upland and lowland spruce/fir forests.
Bald Eagle *Haliaeetus leucocephalus*	Yes	Yes	Large lakes & rivers with large trees for nesting and roosting.
Connecticut warbler *Oporornis agilis*	Yes	Probable	Jack pine or lowland conifer with a thick ericaceous understory.
Three-toed woodpecker *Picoides tridactylus*	Yes	Probable	Coniferous forests with snags. Responds to forest disturbance resulting from fire, insects, disease, wind.
Great gray owl *Strix nebulosa*	Yes	Probable	Nesting habitat of mature trees on wet soil with >60% canopy closure near open foraging areas.
Wood turtle *Clemmys insculpta*	No	No	Upland and lowland habitats with suitable shade and insects for forage. Riparian habitats with open sandy areas for nesting. St. Louis River watershed
Freija's grizzled skipper *Pyrgus centaureae freija*	Yes	No	Upland acidic meadow, scrubby willow, barrens. Known only from McNair management area.
Taiga (Disa)(Mancinus) alpine *Erebia mancinus*	Yes	Probable	Shady black spruce swamps.
Nabokov's (or Northern) blue *Lycaeides idas nabokovi*	Yes	No	*Vaccinium cespitosum* host in open sandy jack pine areas.

Table 5. RFSS Species Known Or Suspected to Occur in BWCAW NNIP Management Project Area			
Scientific name **Common name**	**Potential Habitat Present in project area**	**Known Species Presence in project area**	**Habitat Summary**
SENSITIVE SPECIES: AQUATIC WILDIFE			
Lake sturgeon *Acipenser fulvescens*	Yes	Yes	On SNF: Large lakes and rivers in the Hudson Bay drainage.
Shortjaw cisco *Coregonus zenithicus*	Yes	Yes	Lake Superior, Saganaga and Gunflint Lakes, possibly others.
Nipigon cisco *Coregonus nipigon*	Yes	Yes	Five lakes from along the U.S./Canada border from South Lake west to Loon Lake near Lac LaCroix.
Northern brook lamprey *Ichthyomyzon fossor*	Yes	Yes	Warm, medium-sized, low-gradient streams with sections of higher gradient reaches suitable for spawning. Ammocoete's require organically enriched, sandy substrate until metamorphosis.
Creek heelsplitter *Lasmigona compressa*	Yes	Yes	Headwaters of larger rivers. St. Louis river and tributaries. Lake of the Woods tributaries.
Black sandshell *Ligumia recta*	Yes	No	Wide rivers with moderate current and deep run or glide habitat
Headwaters Chilostigman caddisfly *Chilostigma itascae*	Yes	No	Small , open headwater stream environments with springs and wet meadows and rich swamp to poor fen habitats within large acid to minerotrophic peatland complexes.
Ebony boghaunter *Willimsonia flechen*	Yes	No	Lentic environments: bogs, fens; microhabitat is water suspended or saturated sphagnum. It has occurred on the SNF.
Quebec Emerald dragonfly *Somatochlora brevicincta*	Yes	No	Predominantly bogs, fens, and heaths.
Scientific name **Common name**	**Potential Habitat Present in Project Area**	**Known Species Presence in Project Area**	**Habitat Summary**
SENSITIVE SPECIES: Vascular Plants (Note: Unless cited otherwise, habitat descriptions are derived from information provided by the Minnesota Natural Heritage and Non-game Research Program [MNDNR 2011])			
Moschatel *Adoxa moschatellina*	No	No	Shaded damp cliffs and slopes in upland mature northern hardwood forest on North Shore
Long-leaved arnica *Arnica lonchophylla*	Yes	Yes	Cool & moist cliffs and ledges on North Shore. Arctic disjunct
Maidenhair spleenwort *Asplenium trichomanes*	Yes	Yes	In crevices of moist, mostly east-facing cliffs, ledges, and talus, Rove formation
Alpine milkvetch *Astragalus alpinus*	Yes	No	Sandy, gravelly fluctuating shorelines with sparse vegetation. Inland strand beach - sparse vegetation
Swamp beggar-ticks *Bidens discoidea*	Yes	Yes	Wet habitats: silty shores, hummocks in floating mats and swamps, partly submerged logs
Triangle grape-fern *Botrychium lanceolatum* var *angustisegmentum*	No	No	Northern hardwood forest, old fields, old logging roads, trails

Table 5. RFSS Species Known Or Suspected to Occur in BWCAW NNIP Management Project Area

Scientific name **Common name**	**Potential Habitat Present in project area**	**Known Species Presence in project area**	**Habitat Summary**
Common moonwort *Botrychium lunaria*	Yes	No	Open habitats such as old log landings, sawmill sites, old building sites
Michigan moonwort *Botrychium michiganense (hesperium)*	Yes	No	Open habitats such as old log landing, old dirt roads, gravel pits, power line corridors, and borrow pits. Also, beach ridges, old fields, trails, and dredge spoil dumps (Walton, 2000)
Goblin fern *Botrychium mormo*	No	No	Mesic northern hardwood forest with thick leaf litter layer
Pale moonwort *Botrychium pallidum*	Yes	Yes	Open, disturbed habitats, log landings, roadsides, dunes, sandy gravel pits.
Ternate grape-fern *Botrychium rugulosum (=ternatum)*	Yes	No	Generally open habitats, such as old log landings and edges of trails.
Least moonwort *Botrychium simplex*	Yes	Yes	Generally open habitats, such as old log landings, roadside ditch, trails, open fields, base of cliff, railroad rights of way
Floating marsh-marigold *Caltha natans*	Yes	Yes	Perennial herb; shallow water of pools, ditches, sheltered lake margins, slow moving creeks, sloughs and oxbows, pools in shrub swamps
Fairy slipper *Calypso bulbosa*	Yes	Yes	Hummocks in northern white cedar swamps, moist to wet lowland conifer swamps, and to lesser extent in upland coniferous forests (Smith, 1993)
New England sedge *Carex novae-angliae*	No	No	Moist woods with sugar maple, also with birch, aspen, tall shrubs; yellow birch and white spruce dominated forest
Ross' sedge *Carex rossii*	Yes	No	Rocky summits, dry exposed cliff faces, rocky slopes, in east Border Lakes subsection
Douglas's hawthorn *Crataegus douglasii*	Yes	Yes	North Shore rocky, gravelly streambeds/banks and open areas; and rocky borders of woods
Ram's-head lady's slipper *Cypripedium arietinum*	Yes	Yes	Wide variety of forests, both upland and lowland, but in MN predominantly in white cedar swamps; also in forests dominated by jack pine, red pine, or white pine
Linear leaved sundew *Drosera linearis*	Yes	No	Minerotrophic water tracks in patterned peatlands
Neat spike-rush *Eleocharis nitida*	Yes	No	Mineral soil of wetlands, often w/ open canopy and disturbance, such as logging roads/ditches through wetlands
Appalachian fir club moss *Huperzia appalachiana*	Yes	Yes	Shelves and crevices on cliff/talus/rock outcrops, and shrub dominated talus piles
Moor rush	Yes	Yes	Shallow pools in non-forested peatlands,

Table 5. RFSS Species Known Or Suspected to Occur in BWCAW NNIP Management Project Area

Scientific name **Common name**	**Potential Habitat Present in project area**	**Known Species Presence in project area**	**Habitat Summary**
Juncus stygius			often in a sedge-dominated community
Creeping rush *Juncus subtilis*	Yes	Yes	Sandy lakeshore – only known occurrence in BWCAW (Gerdes, 2005a)
Auricled twayblade *Listera auriculata*	Yes	Yes	On alluvial or lake-deposited sands or gravels, with occasional seasonal flooding, associated with riparian alder or spruce/fir forest
American shore-grass *Littorella uniflora*	Yes	Yes	Shallow margins of nutrient-poor lakes, seepage lakes, sandy substrate, may have fine gravel/organic soil. Fluctuating water level up to about one meter.
Large-leaved sandwort *Moehringia macrophylla*	Yes	Yes	Cliffs/rock outcrops, talus, conifer sites on shallow soils, pine plantation with rocky outcrops; usually semi-open shrub or tree canopy
Fall dropseed muhly *Muhlenbergia uniflora*	Yes	Yes	Wet sandy beaches, floating peat mats
Dwarf water-lily *Nymphaea leibergii*	Yes	Yes	Slow moving streams, rivers, beaver impoundments 1-2 m deep. Occurs at outer margin of emergent vegetation.
Chilean sweet cicely *Osmorhiza berteroi*	No	No	Northern hardwood forest dominated by sugar maple on North Shore.
Sticky locoweed *Oxytropis borealis* var *viscida*	Yes	No	Slate cliffs and talus slopes in east Border Lakes subsection. Arctic/alpine disjunct
Canada Rice Grass *Piptatherum canadense*	Yes	No	Sandy/gravelly soil; red pine/jack pine plantations, borders, edges, trailsides, openings (Gerdes, 2005)
Western Jacob's ladder *Polemonium occidentale ssp. lacustre*	No	No	Primarily white cedar swamps, also mixed conifer swamps; thrives in openings (Carlson and Sather, 2001)
Braun's holly fern *Polystichum braunii*	Yes	Yes	Cool, shady cliffs and slopes in northern hardwoods in North Shore Highlands subsection
Oakes pondweed *Potamogeton oakesianus*	Yes	No	Quiet, acidic waters of bogs, ponds, and lakes
Rough-fruited fairy bells *Prosartes trachycarpa*	Yes	No	Semi-open jack pine forest with aspen, birch, shallow rocky soils, in east Border Lakes subsection
Lesser wintergreen or Small shinleaf *Pyrola minor*	Yes	Yes	Black spruce swamps, and ecotone between uplands and lowland alder/conifer swamp, prefers closed canopy.
Cloudberry *Rubus chamaemorus*	Yes	Yes	Black spruce/sphagnum forest, acidic. SNF at southern edge of species range
Nodding saxifrage *Saxifraga cernua*	Yes	Yes	Cliffs, ledges, diabase cliff (calcium based feldspars). Arctic/alpine disjunct. One

Table 5. RFSS Species Known Or Suspected to Occur in BWCAW NNIP Management Project Area			
Scientific name **Common name**	**Potential Habitat Present in project area**	**Known Species Presence in project area**	**Habitat Summary**
			location in MN on open cliff.
Encrusted saxifrage *Saxifraga paniculata*	Yes	Yes	Cliffs, sheltered crevices, and ledges of north-facing cliffs; Arctic/alpine disjunct
Awlwort *Subularia aquatica*	Yes	Yes	Beach zone of sandy nutrient-poor lakes. Shallow lake margins. Submerged or emerged, or stranded. 15-45 cm deep water, but can occur deeper. Can flower while stranded or under other conditions.
Canada yew *Taxus canadensis*	Yes	Yes	Wide variety of uplands and lowlands, including cedar/ash swamps, talus and cliffs, northern hardwoods, aspen/birch forest (USDA Forest Service, 2012)
False-asphodel *Tofieldia pusilla*	No	No	Sedge mats at edges of shoreline rock pools along Lake Superior. Arctic disjunct.
Lance-leaved violet *Viola lanceolata*	Yes	Yes	Sandy to peaty lakeshores; borders of marshes and bogs, damp sand ditches (USDA Forest Service, 2004g)
Barren strawberry *Waldsteinia fragarioides*	Yes	Yes	Upland coniferous and deciduous forests, in recently harvested areas, established plantations, and areas with no recent harvest
Smooth woodsia *Woodsia glabella*	Yes	Yes	Moist, north-facing cliffs along Lake Superior. Arctic disjunct.
SENSITIVE SPECIES: Lichens and bryophytes (Habitat information taken from USDA Forest Service 2000a, and Wetmore 2000 and 2001, and as cited below)			
A lichen sp. *Arctoparmelia centrifuga*	Yes	No	Lichen; Sunny rocks and open talus slopes (USDA Forest Service, 2002a)
A lichen sp. *Arctoparmelia subcentrifuga*	Yes	No	Lichen; Sunny rocks and open talus slopes
a lichen sp. *Caloplaca parvula*	Yes	No	Smooth bark of young black ash in moist, humid old growth black ash stand (USDA Forest Service, 2002c)
a lichen sp. *Cetraria aurescens*	Yes	Yes	Conifer bark in lowland conifer swamps (old cedar/black spruce - USDA Forest Service, 2002d)
a lichen sp. *Cladonia wainoi (= pseudorangiformis)*	Yes	Yes	On rock outcrops and thin soil – exposed sites with lots of light (USDA Forest Service, 2002e)
A liverwort sp. *Frullania selwyniana*	Yes	No	Lowland cedar swamps on bark of white cedar (Janssens, 2002)
Port-hole lichen *Menegazzia terebrata*	Yes	No	Cedar swamps, especially old growth; base of cedar trees (USDA Forest Service, 2002h)
a Dog lichen *Peltigera venosa*	Yes	No	Soil and moist cliffs, exposed root wads (USDA Forest Service, 2002i)
a lichen sp.	Yes	No	Mossy rocks, trees in partially shaded,

Table 5. RFSS Species Known Or Suspected to Occur in BWCAW NNIP Management Project Area			
Scientific name **Common name**	**Potential Habitat Present in project area**	**Known Species Presence in project area**	**Habitat Summary**
Pseudocyphellaria crocata			moist, frequently foggy habitats (USDA Forest Service, 2002j)
A lichen sp. *Ramalina thrausta*	Yes	No	Cedar swamps, especially old growth (USDA Forest Service, 2002k)
a lichen sp. *Sticta fuliginosa*	Yes	No	On hardwoods in humid, old growth cedar or ash bogs (USDA Forest Service, 2002l)
a lichen sp. *Usnea longissima*	Yes	No	On old conifers in moist situations, often in or near a conifer or hardwood swamp (USDA Forest Service, 2002m)

2.2 EFFECTS ANALYSIS

For Alternative 1, the Biological Evaluation was written in 2006 for the Superior National Forest Non-native Invasive Plant Management Project. The effects are summarized below but please see the 2006 BE for the full analysis (USDA Forest Service 2006). The RFSS list was updated in 2011 so not all of the species analyzed in 2006 are analyzed in Alternatives 2 and 3. However, the species that were added to the RFSS list in 2011 do have supplemental analysis below for Alternative 1. Two animals, gray wolf and bald eagle, were Federally listed as Threatened in 2006, but are on the RFSS list now, and they are analyzed for all alternatives in this BE.

For Alternative 2, the analysis below compares the proposed use of herbicides in this project to the outcomes of Forest Service herbicide risk analyses. The USDA Forest Service contracted with Syracuse Environmental Research Associates (SERA) to evaluate ecological and toxicological data based on Environmental Protection Agency (EPA) studies and other current peer-reviewed scientific literature. Analysis of the risks to wildlife and aquatic resources from the proposed use of herbicides is based on SERA Human Health and Ecological Risk Assessments (RAs), their associated worksheets, and other documents. The SERA RAs and worksheets are incorporated into this analysis and can be found at http://www.fs.fed.us/foresthealth/pesticide/risk.shtml.

SERA's risk assessments quantitatively characterize the risks for all four herbicides proposed for use in this project (RAs: metsulfuron methyl - SERA 2004; imazapic - SERA 2004; aminopyralid - SERA 2007a; triclopyr - SERA 2011a; worksheets: metsulfuron methyl – SERA 2006; imazapic – SERA 2006; aminopyralid – SERA 2007b; triclopyr – SERA 2011b and SERA 2011c). The RAs quantify hazards posed by the herbicides, quantitatively estimate herbicide exposure to wildlife and aquatic resources, and describe a dose-response relationship to come up with the ecological risk of the herbicide to wildlife and aquatic resources.

The toxicities of the four herbicides proposed for use are presented in detail in DEIS Appendix D. During the herbicide registration process, the EPA evaluated the toxicity of all of these herbicides on wildlife and aquatic resources. Judgments about the potential hazards of herbicides to these resources are based, in large part, on the results of standard acute and chronic bioassays on mammals, birds, fish, invertebrates, and in some cases amphibians. Detailed toxicological analysis and literature review for each herbicide are found in the SERA RAs.

Triclopyr, imazapic, aminopyralid, and metsulfuron methyl are all low toxicity herbicides that have been used safely on the Superior National Forest for the last five years.

As part of each risk assessment, a set of general exposure scenarios was developed based on the normal use of the herbicides. These scenarios include: accidental direct spray of an organism, accidental contact with treated vegetation, eating contaminated vegetation or prey, drinking contaminated water, accidental spill in a pond, accidental spray/drift/leaching into a pond, and accidental spray/drift/leaching into a stream. These scenarios are very conservative, and many of their assumptions model a worst-case scenario. Some of them model short-term (acute) effects, and others model long-term (chronic) effects.

During the herbicide registration process, toxicological studies are conducted on a variety of species. Generally these studies are used to develop the No Observed Adverse Effect Level (NOAEL – this is the level of herbicide at which no adverse effects are observed). The NOAELs are generally very conservative (i.e. health protecting) and are made even more conservative by the application of a safety factor of 100. The safety factor accounts for data uncertainty and other factors representing corrections for both intra- and inter-species variability. The RAs for these four herbicides generally compare the outcomes of the exposure scenarios to the NOAEL to evaluate whether the exposure scenarios for wildlife or aquatic life could potentially exceed the dose at which adverse effects begin to be observed.

The RAs combine three factors: the herbicides' inherent hazard, an estimate of exposure, and a dose-response assessment. Together, these generate an estimate of risk for each scenario for each chemical – referred to as the Hazard Quotient (HQ). The HQ is the ratio between the estimated dose (the amount of herbicide received from a particular exposure scenario) and the dose at which no adverse effect is observed. When a scenario has a dose less than the NOAEL dose, then the HQ is less than 1.0, and toxic effects are unlikely for that specific scenario. The herbicides proposed for use in this project are compared in the effects analysis based on their HQ calculated in the pertinent RA.

Table 5 summarizes the findings of the ecological risk assessments to wildlife and aquatic resources.

Table 5 Summary of findings from USDA Forest Service ecological risk assessments for proposed herbicides				
Application Rate	Terrestrial Mammals	Birds	Insects	Fish & Other Aquatic Species
Imazapic (Source: SERA 2004, p. 4-20 – 4-24)				
10 fl. oz./ac.	No adverse effects are plausible using typical or worst case exposure scenarios at either average or maximum rates.	No adverse effects are plausible using typical or worst case exposure scenarios at either average or maximum rates.	No adverse effects are plausible using typical or worst case exposure scenarios at either average or maximum rates.	Very low risk of adverse effects at either average or maximum application rates
Triclopyr (Source: SERA 2011a, p. 130)				
192 fl. oz./ac.	Mammals consuming contaminated vegetation are at risk of adverse effects. Large mammals are at greater risk than small mammals.	Birds consuming contaminated vegetation are at risk of adverse effects.	Triclopyr does not pose substantial risks to insects across the range of labeled application rates.	Neither terrestrial nor aquatic applications of triclopyr TEA pose substantial risks to aquatic animals across the range of labeled application rates.
Aminopyralid (SERA 2007a, p. 102)				
5 fl. oz./ac.	There is no indication that mammals would be adversely affected by aminopyralid	There is no indication that birds would be adversely affected by aminopyralid	There is no indication that insects would be adversely affected by aminopyralid	There is no indication that aquatic animals would be adversely affected by aminopyralid
Metsulfuron methyl (Source: USDA Forest Service 2004, p. 4-23 – 4-28)				
1 oz./ac.	Risk of adverse effects resulting from either average or maximum application rates is unlikely.	Risk of adverse effects resulting from either average or maximum application rates is unlikely.	Risk of adverse effects resulting from either average or maximum application rates is unlikely.	Risk of adverse effects resulting from either average or maximum application rates is unlikely.

3.1 REGION 9 SENSITIVE SPECIES: TERRESTRIAL WILDLIFE

Analysis Area

The area covered by the analysis of direct and indirect effects includes all lands administered by the Superior National Forest in the BWCAW. The rationale for this choice is that this is the area where project activities, and hence, potential direct and indirect effects, could occur. The area covered by the cumulative effects analysis includes lands of all ownerships within the BWCAW. This cumulative effects analysis area was selected because the adjacent non-Forest Service lands in the project area share a number of physical characteristics (e.g. bedrock features, land forming processes) which have influenced and constrained land uses in a similar manner. Furthermore, lands of other ownerships are often in close proximity to Forest Service lands. For these reasons, the project area boundary makes a logical analysis unit for cumulative effects.

The time period for direct, indirect, and cumulative effects is ten years from the time project activities begin, because no effects of project activities would occur until implementation, and because most project activities should be completed within 10 years.

Existing Condition

The project area has suitable habitat for all of the terrestrial RFSS animals except wood turtle. Table 5 shows the species for which there are known occurrences in the project area. For several animals, the known occurrence is listed as "probable", indicating that while no known occurrences have been documented, there is so much suitable habitat that it is likely that the species occurs in the project area.

No site specific surveys were conducted for any RFSS animal for the NNIP Management project. However, information from the DNR's Rare Feature Database (MNDNR 2012) was used to evaluate the locations of known RFSS animal populations in the project area. In general, most of the NNIP sites are poor habitat for RFSS animals since 81% of sites occur on campsites, portages, trails, or old resort/cabin sites.

Direct/Indirect Effects

The Biological Evaluation for the 2006 Superior National Forest Non-native Invasive Plant Project concluded that the alternative selected for that project in the 2006 DN would have no effects to the majority of terrestrial animal species on the RFSS list at the time. The BE concluded that for three birds (Connecticut warbler, bay breasted warbler, and olive sided flycatcher) treatments could disturb nesting birds but would not likely cause nest abandonment (USDA Forest Service 2006). For the three bats (northern myotis, little brown myotis, and tri-colored bat) added to the RFSS list in 2011, manual treatments would not affect any suitable habitat for these species under Alternative 1 (No Action), so there would be no effect of Alternative 1 on these three bats. Bald eagle and gray wolf, which were Federally listed as Threatened in 2006, were analyzed in the Biological Assessment in 2006, which concluded that this alternative would have no impacts to these species (USDA Forest Service 2006). Bald eagle and wolf are now listed as RFSS and are included in this BE.

The treatments proposed by this project in Alternatives 2 and 3 would not negatively affect any upland or lowland habitat for any RFSS terrestrial wildlife species. Over 80% of the treatment sites are at campsites, portages/trails, and old resort/cabin sites. None of these types of sites

represent good or preferred habitat for any of the RFSS terrestrial wildlife regardless of the presence of NNIP. Changing the vegetative composition at the site by eradicating small patches of NNIP would not affect the value of the site as habitat. Over the long term, removing the NNIP at these sites would improve overall terrestrial wildlife habitat and prevent NNIP infestations from taking over larger areas of the landscape.

Direct effects to RFSS terrestrial wildlife individuals from contact with herbicide are unlikely. All of the species are mobile and would most likely leave during herbicide application. Manual treatments of NNIP would not impact these species.

The SERA risk assessments evaluated the potential indirect effects of herbicide use on mammals, birds, and insects, and these effects are summarized in Table 5. Except for triclopyr, it is unlikely that any adverse effects would result from either average or maximum application rates of aminopyralid, imazapic, or metsulfuron methyl. For triclopyr, the SERA risk assessment indicates that consumption of contaminated vegetation could cause a risk of adverse effects in mammals and birds. However, for the BWCAW NNIP Management Project, it is unlikely that any RFSS birds, bats, or the wolf would be affected. The types of treatments involving triclopyr would be either cut-stump treatments which would create no contaminated vegetation (none of the species would eat the cut stump) or foliar treatments of purple loosestrife. All of the RFSS birds and bats generally eat insects or other animals but not vegetation, so they are not likely to consume any purple loosestrife that has been sprayed; neither is the wolf. None of the risk assessment scenarios for triclopyr that modeled consumption of fish, insects, or small mammals by birds or mammals indicated that these scenarios posed any risk for the target species. Therefore, it is unlikely that any RFSS birds, bats, or the wolf would be adversely affected by project activities.

Eastern heather voles could consume contaminated vegetation from purple loosestrife treatments, but the treatments would only affect 0.3 acres scattered across the entire project area. Some impacts to individual heather voles could occur but are not likely.

In general, the small risk of impacts from Alternatives 1, 2, or 3 would be balanced by the long term improvements to habitat for RFSS terrestrial wildlife. Operational standards and guidelines (DEIS Appendix B) and site specific mitigation measures limiting activities around active bald eagle nests would further reduce risk.

<u>Cumulative Effects</u>

As stated in the BE for the 2006 Superior National Forest Non-native Invasive Plant Project, Alternative 1 could have a small minor beneficial cumulative effect for terrestrial RFSS animal species (USDA Forest Service 2006).

There would be no direct or indirect negative effects of Alternative 3 on terrestrial RFSS wildlife, so there would be no cumulative effects of Alternative 3 on these species.

Alternative 2 would have no risk of impacts to any terrestrial RFSS wildlife species except heather vole, so for most of the species there would be no cumulative effects of Alternative 2. For heather vole, there could be some herbicide treatments conducted for NNIP at BWCAW

entry points that are outside wilderness under the 2006 NNIP Management Project. There could also potentially be herbicide treatments conducted by homeowners whose private land borders the BWCAW, such as landowners on Snowbank Lake. However, in general these treatments would be so dispersed that they represent a very minor cumulative effect. Therefore, the risk of cumulative effects to heather vole from Alternative 2 is quite low.

Determination
Alternative 1 would have no impact on heather vole, northern goshawk, boreal owl, great grey owl, wood turtle, Mancinus alpine, red disked alpine, Jutta arctic, Nabokov's blue, Freija's grizzled skipper, little brown myotis, northern myotis, tri-colored bat, gray wolf, or bald eagle.

Alternative 1 may impact individuals of olive sided fly catcher, bay breasted warbler, or Connecticut warbler, but is not likely to result in a trend towards federal listing or a loss of viability.

Alternative 2 would have no impact on northern goshawk, boreal owl, gray wolf, olive-sided flycatcher, little brown myotis, northern myotis, tri-colored bat, bay-breasted warbler, bald eagle, Connecticut warbler, three-toed woodpecker, great gray owl, Frieja's grizzled skipper, Taiga alpine, or Nabokov's blue.

Alternative 2 may impact individual Eastern heather vole, but is not likely to cause a trend to federal listing or a loss of viability.

Alternative 3 would have no impact on any terrestrial RFSS wildlife species.

3.2 REGION 9 SENSITIVE SPECIES: AQUATIC WILDLIFE

Analysis area and methods
The area covered by the analysis of direct and indirect effects includes all lands administered by the Superior National Forest in the BWCAW. The rationale for this choice is that this is the area where project activities, and hence, potential direct and indirect effects, could occur. The area covered by the cumulative effects analysis includes lands of all ownerships within the BWCAW. This cumulative effects analysis area was selected because non-federal lands within the project area boundaries share the same watersheds, landforms, and landuse. In turn, these characteristics dictate the physical and chemical water quality/quantity and biological integrity throughout the area. The biological integrity includes the distribution and abundance of aquatic RFSS. As a result, this boundary makes a logical analysis unit for cumulative effects.

The time period for direct, indirect, and cumulative effects is ten years from the time project activities begin, because no effects of project activities would occur until implementation, and because most project activities should be completed within 10 years.

Existing Condition
The project area has suitable habitat for all of the aquatic RFSS animals. Table 5 shows the species for which there are known occurrences in the project area. No site specific surveys were conducted for any RFSS aquatic species for the NNIP Management project. However, information from the DNR's Rare Feature Database (MNDNR 2012) was used to evaluate the

locations of known RFSS aquatic species populations in the project area. Many of the proposed treatment sites occur at campsites along lake shorelines.

Direct/Indirect Effects

For the BWCAW NNIP Management Project, the overall effects of all three alternatives to aquatic RFSS would be low. No road or stream crossings would be constructed, and the percentage of upland open and upland young forest would not change because of the project. In general the effects of the project are expected to be low because such a small portion of the project area is proposed for treatment and because the treatment sites are dispersed across the entire project area.

The Biological Evaluation for the 2006 Superior National Forest Non-native Invasive Plant Project concluded that the alternative selected for that project in the 2006 DN would have no effects to shortjaw cisco. The BE concluded that for lake sturgeon, creek heelsplitter, black sandshell mussel, and northern brook lamprey, the project could impact individuals because removal of NNIP could impact riparian vegetation and subsequently affect these species (USDA Forest Service 2006). For the four species added to the RFSS list in 2011 (Nipigon cisco, headwaters chilostigman caddisfly, ebony boghaunter, and Quebec emerald), manual treatments would not pose any risk to these species. As described for Alternative 3 below, localized removal of small patches of NNIP could cause soil disturbance, but the risk of erosion or sedimentation and subsequent impacts is negligible. See Alternative 3 analysis below for further discussion.

Alternative 2 would have a negligible risk of direct and indirect negative effects to water quality in large, deep lakes, streams, and bogs that the aquatic RFSS use in the project area. Although Minnesota does not have a state water quality standard for any of the herbicides proposed for use (and none are anticipated), there is a standard for a related herbicide, picloram. Picloram is chemically very similar to aminopyralid but much more potent and persistent in the environment, which is part of the reason it has a water quality standard. Although not a perfect comparison, if we use the Minnesota picloram standard of 500 micrograms/liter (because of the chemical similiarity), we can compare the expected levels of the herbicides proposed for use to this standard and make some conclusions. This can cautiously be interpreted to better understand anticipated effects.

The RAs model scenarios where the four proposed herbicides are accidentally sprayed or drift/leach into a pond or stream. Under these scenarios, none of the proposed herbicides would exceed a concentration of 500 micrograms/liter (SERA 2006, SERA 2006, SERA 2007b, SERA 2011b), and would thus not represent a threat to water quality in the project area. The RAs also model a scenario where the four proposed herbicides are accidentally spilled into a pond, and under this scenario three of the herbicides would exceed 500 micrograms/liter (SERA 2006, SERA 2007b, SERA 2011b). This scenario is conservative, and involves spilling 200 gallons of herbicide mix into a ¼ pond that is 1 meter deep. If this were to actually happen in such a small water body, there would be some short term water quality impacts. However, the maximum amount of herbicide that a crew would have on a trip would be the concentrated equivalent of 10 gallons of herbicide mix, much less than the 200 gallons in the scenario, and the water quality standard would not be exceeded. Furthermore, operational standards and guidelines (OSGs -

Appendix B) would greatly reduce the risk that any such spill would happen in the first place. For example, transporting herbicides in their original container which would be inside a second watertight container, or using a catch basin that is at least 50 feet away from water for all mixing operations, would provide a margin of safety that would prevent accidental spills and impacts to water quality.

Alternative 2 would also have a negligible risk of negative health effects to aquatic RFSS. For the four herbicides, no route of exposure or scenario (accidental direct spray of an organism, accidental contact with treated vegetation, eating contaminated vegetation or prey, drinking contaminated water, accidental spill in a pond, accidental spray/drift/leaching into a pond, and accidental spray/drift/leaching into a stream) suggests that the proposed use of any of the herbicides would put aquatic RFSS at risk. For each of the scenarios in the ecological risk analysis, the HQ is below 1.0 and thus there is no plausible risk to aquatic life from these herbicides (SERA 2004, SERA 2004, SERA 2007a, SERA 2011a).

The low risk of negative impacts for Alternative 2 would be further reduced by both project design (e.g. wipe on application of herbicides at locations less than 25 feet from water, choice of low toxicity herbicides for project) and Operational Standards and Guidelines (e.g. not using herbicide before rain, not spraying if wind speeds are greater than 10 m.p.h.) See Appendix B for full description.

For Alternative 3, digging, pulling, or cutting NNIP would generally have inconsequential effects on aquatic RFSS habitat in the BWCAW. Treatment of terrestrial NNIP could create localized areas of soil disturbance, but these would generally be small since 85% of the sites are less than 0.005 acres. Disturbed soil would have a low potential for causing erosion and degrading water quality or affecting aquatic life because the small NNIP sites are scattered over many locations across the BWCAW, and because generally slopes at treatment sites are moderate and would have enough remaining vegetation to eliminate the risk of erosion.

Pulling aquatic NNIP like purple loosestrife could stir up sediment where plants are removed, but this effect would be small and localized. Adequate shoreline vegetation would remain so that no shoreline erosion would result from this project.

Most of the target NNIP are herbaceous upland species, so removing them would not affect habitat for aquatic RFSS. However, treating aquatic NNIP like purple loosestrife would benefit aquatic habitat by improving degraded wetlands and encouraging native wetland plant species. Dense stands of purple loosestrife can impede water flow and reduce open water in wetlands. These positive effects of NNIP treatment on aquatic habitat would be less for Alternative 3 compared to Alternative 2, since the treatments in Alternative 3 would generally take longer to be effective than those proposed for Alternative 2.

Cumulative Effects

As stated in the BE for the 2006 Superior National Forest Non-native Invasive Plant Project, Alternative 1 is not expected to have any cumulative effects to these species because the project will not change existing forest size and age structure within the project area and will thus not affect suitable habitat (USDA Forest Service 2006).

There would be no direct or indirect negative effects of Alternative 2 or 3 on aquatic RFSS animals, so there would be no cumulative effects of Alternative 2 or 3 on these species.

Determination
Alternative 1 would have no impact on shortjaw cisco, Nipigon cisco, headwaters chilostigman caddisfly, ebony boghaunter, and Quebec emerald.

Alternative 1 may impact individuals of lake sturgeon, northern brook lamprey, creek heelsplitter, and black sandshell but is not likely to result in a trend towards federal listing or a loss if viability.

Alternative 2 would have no impact on any aquatic RFSS species.

Alternative 3 would have no impact on any aquatic RFSS species.

3.3 REGION 9 SENSITIVE SPECIES: VASCULAR PLANTS, LICHENS, AND BRYOPHYTES

Analysis area and methods
The area covered by the analysis of direct and indirect effects includes all lands administered by the Superior National Forest in the BWCAW. The rationale for this choice is that this is the area where project activities, and hence, potential direct and indirect effects, could occur. The area covered by the cumulative effects analysis includes lands of all ownerships within the BWCAW. This cumulative effects analysis area was selected because the adjacent non-Forest Service lands in the project area share a number of physical characteristics (e.g. bedrock features, land forming processes) which have influenced and constrained land uses in a similar manner. Furthermore, lands of other ownerships are often in close proximity to Forest Service lands. For these reasons, the project area boundary makes a logical analysis unit for cumulative effects.

The time period for direct, indirect, and cumulative effects is ten years from the time project activities begin, because no effects of project activities would occur until implementation, and because most project activities should be completed within 10 years.

No site specific surveys were conducted for any RFSS animal for the NNIP Management project. However, information from the DNR's Rare Feature Database (MNDNR 2012) was used to evaluate the locations of known RFSS animal populations in the project area. In general, most of the NNIP sites are poor habitat for RFSS animals since 81% of sites occur on campsites, portages, trails, or old resort/cabin sites.

Existing Condition
The project area has suitable habitat for the majority of the RFSS plants. Table 5 shows that within the project area there are known occurrences for 29 out of the 57 RFSS plant species. No site specific surveys were conducted for any RFSS plant for the NNIP Management project. However, information from the DNR's Rare Feature Database (MNDNR 2012) was used to evaluate the locations of known RFSS plant populations in the project area. In general, most of

the NNIP sites are poor habitat for most of the RFSS plants since 81% of sites occur on campsites, portages, trails, or old resort/cabin sites.

If NNIP infestations are found in suitable RFSS plant habitat, prior to treatment of NNIP, an RFSS plant survey will be performed.

Direct/Indirect Effects

The Biological Evaluation for the 2006 Superior National Forest Non-native Invasive Plant Project concluded that the alternative selected for that project in the 2006 DN would have no effects to most of the RFSS plants. The BE concluded that for common moonwort, Michigan moonwort, pale moonwort, ternate grapefern, and least moonwort, the project could impact individuals because aboveground growth of these species could be cut off by accident, but that the individuals would probably re-sprout from underground parts the following year (USDA Forest Service 2006). For the one species added to the RFSS list in 2011 (Oakes' pondweed), manual treatments would not pose any risk to this species. As described for Alternative 3 below, localized removal of small patches of NNIP would not impact Oakes' pondweed because no NNIP grow in the deeper-water aquatic habitat where Oakes' pondweed is found. See Alternative 3 analysis below for further discussion.

For Alternative 2, herbicide use would pose a greater risk to RFSS plants than to aquatic or terrestrial RFSS animals simply because herbicides are designed to be toxic to plants. Project design helps limit the risk to RFSS plants because cut stump and wipe on techniques would pose no risk to RFSS plants since no herbicide would land on non-target vegetation. The risks to RFSS plants from Alternative 2 considered below are from spot spray applications.

Under Alternative 2, spot spraying NNIP with herbicide would have some direct but minor negative impacts to some of the RFSS plants. RFSS plants that grow on bedrock outcrops or in upland disturbed areas could by chance be growing close to non-native invasives, and spray drift could damage or kill the non-target RFSS plant. RFSS plants that grow on rock outcrops or disturbed uplands are more at risk from this effect because these are habitats frequently occupied by NNIP. For the remaining RFSS plants, there is little to no risk of negative impacts from herbicide treatments. No NNIP on the Superior National Forest occur in forested wetlands, so RFSS plants of forested wetlands would not be affected. There is little risk to RFSS plants that occur in non-forested wetlands or dry to mesic uplands either since relatively few NNIP occur in these habitats. The risk to RFSS plants would be mitigated by Operational Standards and Guidelines, such as the requirement to survey for RFSS plants before treating a new NNIP occurrence that is located in suitable RFSS habitat, or the requirement that limits spot application to weather conditions that do not promote herbicide drift. Project design would also limit the risk to RFSS plants; for example, wipe on applications of herbicide for purple loosestrife means that there is no risk of effects to RFSS plants that grow in non-forested wetlands. The overall proportion of the project area affected by treatments would be relatively small compared to the amount of suitable habitat in the project area.

Under Alternative 3, manual removal of NNIP would have some direct but minor negative impacts to some of the RFSS plants. RFSS plants that grow on bedrock outcrops or in upland disturbed areas could by chance be growing close to non-native invasives, and removing the

NNIP could damage the roots or occasionally uproot the RFSS plant. RFSS plants that grow on rock outcrops or disturbed uplands are more at risk from this effect because these are habitats frequently occupied by NNIP. For the remaining RFSS plants, there is little to no risk of negative impacts from manual treatments. No NNIP on the Superior National Forest occur in forested wetlands, so RFSS plants of forested wetlands would not be affected. There is little risk to RFSS plants that occur in non-forested wetlands or dry to mesic uplands either since relatively few NNIP occur in these habitats. The risk to RFSS plants would be mitigated by Operational Standards and Guidelines, such as the requirement to survey for RFSS plants before treating a new NNIP occurrence that is located in suitable RFSS habitat. The overall proportion of the project area affected by treatments would be relatively small compared to the amount of suitable habitat in the project area.

For Alternatives 1, 2, and 3, over the longer term manual removal would have an indirect benefit to RFSS plants. Controlling or eradicating NNIP would help restore native plant communities.

Cumulative Effects

As stated in the BE for the 2006 Superior National Forest Non-native Invasive Plant Project, Alternative 1 could have a small minor beneficial cumulative effect for RFSS plant species (USDA Forest Service 2006).

Alternatives 2 and 3 would have a small risk of cumulative impacts to RFSS plants. There could be some herbicide treatments conducted for NNIP at BWCAW entry points that are outside wilderness under the 2006 NNIP Management Project. There could also potentially be herbicide treatments conducted by homeowners whose private land borders the BWCAW, such as landowners on Snowbank Lake. However, in general these treatments would be so dispersed that they represent a very minor cumulative effect.

For Alternatives 2 and 3, fire management activities in the project area, whether for wildland fire or prescribed fires such as those considered under the 2001 BWCAW Fuel Treatment EIS, could also have minor negative cumulative impacts on RFSS plants. For example, fire line constructed for the Pagami Creek Fire in the project area created very local negative impacts to suitable habitat for RFSS plants, but most of this disturbance will likely recover and serve as suitable habitat in the future. It is reasonable to expect future wildland and prescribed fires in the project area, and these would have similar cumulative effects under both alternatives. The risk of cumulative effects to RFSS plants from Alternatives 2 and 3 is quite low.

Determination

For Alternative 1, the proposed activities would have no impact on alpine milkvetch, creeping rush, swamp beggar-ticks, floating marsh-marigold, linear-leaved sundew, neat spike rush, moor rush, auricled twayblade, fall dropseed muhly, American shoregrass, dwarf water lily, Oakes' pondweed, awlwort, lance-leaved violet, *Cladonia wainoi*, large-leaved sandwort, long leaved arnica, maidenhair spleenwort, Ross' sedge, sticky locoweed, nodding saxifrage, encrusted saxifrage, smooth woodsia, *Arctoparmelia centrifuga*, *Arctoparmelia subcentrifuga*, Douglas hawthorne, Appalachian fir clubmoss, small shinleaf, cloudberry, fairy slipper, ram's head ladyslipper, western Jacob's ladder, *Caloplaca parvula, Certraria aurescens, Frullania selwyniana, Menegazzia terebrata, Ramalina thrausta, Sticta fuliginosa*, *Usnea longissima*,

Pseudocyphellaria crocata, moschatel, triangle grapefern, goblin fern, New England sedge, Chilean sweet cicely, Braun's holly fern, Canada yew, barren strawberry, Canada ricegrass, rough fruited fairy bells, or *Peltigera venosa*.

The proposed activities in Alternative 1 may impact individuals of common moonwort, Michigan moonwort, pale moonwort, ternate grapefern, and least moonwort but are not likely to cause a trend to federal listing or loss of viability.

For Alternative 2, the proposed activities would have no impact on alpine milkvetch, swamp beggar-ticks, floating marsh-marigold, linear-leaved sundew, neat spike rush, moor rush, creeping rush, auricled twayblade, fall dropseed muhly, American shoregrass, dwarf water lily, Oakes pondweed, awlwort, lance-leaved violet, fairy slipper, ram's head ladyslipper, small shinleaf, cloudberry, *Caloplaca parvula*, *Certraria aurescens*, *Frullania selwyniana*, *Menegazzia terebrata*, *Pseudocyphellaria crocata*, *Ramalina thrausta*, *Sticta fuliginosa*, *Usnea longissima*, Ross' sedge, sticky locoweed, Canada ricegrass, rough-fruited fairybells, Canada yew, barren strawberry, *Peltigera venosa*, moschatel, triangle grapefern, goblin fern, New England sedge, Chilean sweet cicely, false asphodel, and western Jacob's ladder.

For Alternative 2, the proposed activities may impact individuals of long-leaved arnica, maidenhair spleenwort, common moonwort, Michigan moonwort, pale moonwort, ternate grapefern, least moonwort, Douglas hawthorn, large-leaved sandwort, Appalachian fir clubmoss, Braun's holly fern, nodding saxifrage, encrusted saxifrage, smooth woodsia, *Arctoparmelia centrifuga*, *Arctoparmelia subcentrifuga*, and *Cladonia wainoi* but are not likely to cause a trend to federal listing or loss of viability.

For Alternative 3, the proposed activities would have no impact on alpine milkvetch, swamp beggar-ticks, floating marsh-marigold, linear-leaved sundew, neat spike rush, moor rush, creeping rush, auricled twayblade, fall dropseed muhly, American shoregrass, dwarf water lily, Oakes pondweed, awlwort, lance-leaved violet, fairy slipper, ram's head ladyslipper, small shinleaf, cloudberry, *Caloplaca parvula*, *Certraria aurescens*, *Frullania selwyniana*, *Menegazzia terebrata*, *Pseudocyphellaria crocata*, *Ramalina thrausta*, *Sticta fuliginosa*, *Usnea longissima*, Ross' sedge, sticky locoweed, Canada ricegrass, rough-fruited fairybells, Canada yew, barren strawberry, *Peltigera venosa*, moschatel, triangle grapefern, goblin fern, New England sedge, Chilean sweet cicely, false asphodel, and western Jacob's ladder.

For Alternative 3, the proposed activities may impact individuals of long-leaved arnica, maidenhair spleenwort, common moonwort, Michigan moonwort, pale moonwort, ternate grapefern, least moonwort, Douglas hawthorn, large-leaved sandwort, Appalachian fir clubmoss, Braun's holly fern, nodding saxifrage, encrusted saxifrage, smooth woodsia, *Arctoparmelia centrifuga*, *Arctoparmelia subcentrifuga*, and *Cladonia wainoi* but are not likely to cause a trend to federal listing or loss of viability.

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APPENDIX A – HERBICIDE REFERENCE TABLES

Table A-1. Herbicide environmental characteristics.

Herbicide	Characteristics		
	Mechanisms of degradation	**Half-life in soil**	**Mobility in Soil**
Triclopyr	Degradation mainly by soil microbes	14 days	Moderate to high ($K_{o/c}$ = 59 [SERA 2011 p. 206]
Aminopyralid	Degradation by soil microbes and sunlight	130 days (lab study); 25-38 days in field studies	High ($K_{o/c}$ range = 1-27 [SERA 2007, p. 129])
Imazapic	Degradation primarily due to soil microbes	113 days (lab study); 31-410 days (field study)	Moderate ($K_{o/c}$ range = 7-267 [SERA 2004, p. tables-1])
Metsulfuron methyl	Degraded by soil microbes and chemical hydrolysis	120 days	Moderate to high ($K_{o/c}$ range = 4-206 [SERA 2004, p. tables-1, tables-5])

Table A-2. Herbicide Solubility, Half-life, and Aquatic Toxicity Data

Herbicide	Solubility	Aquatic Half-life	Aquatic Toxicity and Bioconcentration
Triclopyr	Salt formulation is water-soluble.	Salt formulation can degrade in sunlight with a half-life of 1-8 days [SERA 2011 p. 204].	Acid and salt formulation is slightly toxic to fish and aquatic invertebrates. Triclopyr acid has relatively low potential for bioconcentration (SERA 2011, p. 62).
Aminopyralid	Soluble in water	About half a day – degraded by sunlight (SERA 2007)	Aminopyralid is practically non toxic to fish and aquatic invertebrates (USEPA 2005). Not expected to bioconcentrate in fish.
Imazapic	Soluble in water	30 days – degraded by sunlight	Low toxicity to fish (SERA 2004, p. 4-4). Very low level of bioconcentration in fish tissue (SERA, p. 3-17).
Metsulfuron methyl	Soluble in water	53-279 days (DuPont 2007)	Low toxicity to fish and aquatic invertebrates, (SERA 2004, p. 4-5 to 4-6). Studies suggest low potential for bioconcentration (SERA 2004, p. 3-19).

Table A-3. Herbicide Toxicity Information For Mammals

Herbicide	*Acute Toxicity*						*Chronic Toxicity*		
(Technical product unless specific formulation noted)	*Oral LD_{50} (rat)*	*Dermal LD_{50} (rabbit)*	*4-Hour Inhalation LC_{50} (rat)*	*Skin Irritation (rabbit)*	*Skin Sensitization (guinea pig)*	*Eye Irritation (rabbit)*	*24-Month Dietary NOEL (mouse)*	*24-Month Dietary NOEL (rat)*	*12-Month Dietary NOEL (dog)*
	mg/kg BW		*mg/L*				*mg/kg BW/day*		
Triclopyr									
Renovate	2574(M) 1847(F)	>5000	>2.6	May cause	May cause	Severe	NA	12	0.5
Garlon 3A	2574(M) 1847(F)	>5000	>2.6	May cause	May cause	Severe	↑Chronic toxicity data available↑ only for technical triclopyr acid		
Aminopyralid									
Aminopyralid acid	5000	>5000	>5.5	No	No	Moderate-Severe	50 (NOAEL)	250 (NOAEL)	93 (NOAEL)
Milestone	5000	>5000	>5.79	Slight	No	Slight	↑Chronic toxicity data available↑ only for technical aminopyralid acid		
Imazapic									
Imazapic	>5000	>5000	>4.83	None	No	Slight	>1288	>1133	150 (LOAEL)
Metsulfuron methyl									
Metsulfuron methyl	>5000	>2000	>5	Slight	None	Moderate	5000 ppm (18mo)	500ppm	500 ppm

Data from: Triclopyr – SERA 2011, Appendices 4, 5, & chapters 3.1.4, 3.1.5, 3.1.11-3.1.13; Aminopyralid – SERA 2007, Appendix 3-1 & USEPA 2005; Imazapic – SERA 2004, Appendix 1, & chapters 3.1.4, 3.1.5, 3.1.11-3.1.13; Metsulfuron methyl - SERA 2004, Appendix 1, & Chapters 3.1.4, 3.1.5, 3.1.11-3.1.13.
NA = Not Available

Table A-4. Herbicide Toxicity Information for Birds, Invertebrates, and Fish

Herbicide Formulation (Technical product unless specific formulation noted)	Avian Receptors				Terrestrial Invertebrates		Aquatic Receptors		
	Bobwhite Quail		Mallard Duck		Earth-worm	Honeybee	Daphnia	Bluegill	Rainbow Trout
	Oral LD_{50}	8-day dietary LC_{50}	Oral LD_{50}	8-day dietary LC_{50}	LC_{50}	Topical LD_{50}	48-hour LC_{50}	96-hour LC_{50}	96-hour LC_{50}
	mg/kg BW	ppm (in food)	mg/kg BW	ppm (in food)	ppm (in soil)	ug/bee	Mg/L (in water)		
Triclopyr									
Triclopyr acid		2934	1698	5620	1110	>100	357-837	155	79
Triclopyr triethylamine salt		11,622	2055	>10000	146	>100	357-837	65-233	274-286
Aminopyralid									
Aminopyralid acid	>2250	>5556 mg/kg diet		>5496 mg/kg diet	>5000 mg/kg soil	>100	>98.6	>100	>100
Imazapic									
Imazapic	>2150	>5000	>2150	>5000		>100	100	>100	>100
Metsulfuron methyl									
Metsulfuron methyl	>5620ppm	>5620	>5620ppm	>5620	>1000 mg/kg soil	>25	>150	>150	>150

LD_{50} - Lethal Dose 50; LC_{50} - Lethal Concentration 50. From: Triclopyr – SERA 2011, Appendices 2, 3, 5, 7; Aminopyralid – USEPA 2005; Imazapic - SERA 2004, Appendices 2, 3; Metsulfuron methyl - SERA 2004, Appendices 2, 3, 5, 6; DuPont 2007 (for toxicity to earthworm).